
JWORKS
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Cloud Practice
EKS workshop
Deploying your application on a Kubernetes cluster
ORDINA
Ahead of change

INTRODUCTION

What to expect from this workshop?

- Kubernetes introduction
- EKS infrastructure explanation
  - Semi-managed implementation by Amazon
- Jenkins jobs
- Demo / workshop
  - Deploy an application to our Kubernetes cluster
  - Set up an automated pipeline which will set this up for you

What is Kubernetes?

- Container-orchestration system
- Open source
  - CNCF (Cloud Native Computing Foundation)
- Deployment
- Scaling
- Failover
- Uses containers (Docker, Cri-O, …)

KUBERNETES

JWorks Kubernetes

- JWorks Development cluster (production ready)
- Hosted at Amazon
  - Elastic Kubernetes Service (EKS)
  - Control + master services managed by Amazon
  - Worker nodes not managed
- Other providers
  - Google (GKE)
  - Azure (AKS)
  - DigitalOcean

Amazon EKS

Google Kubernetes Engine

Azure Kubernetes Service (AKS)

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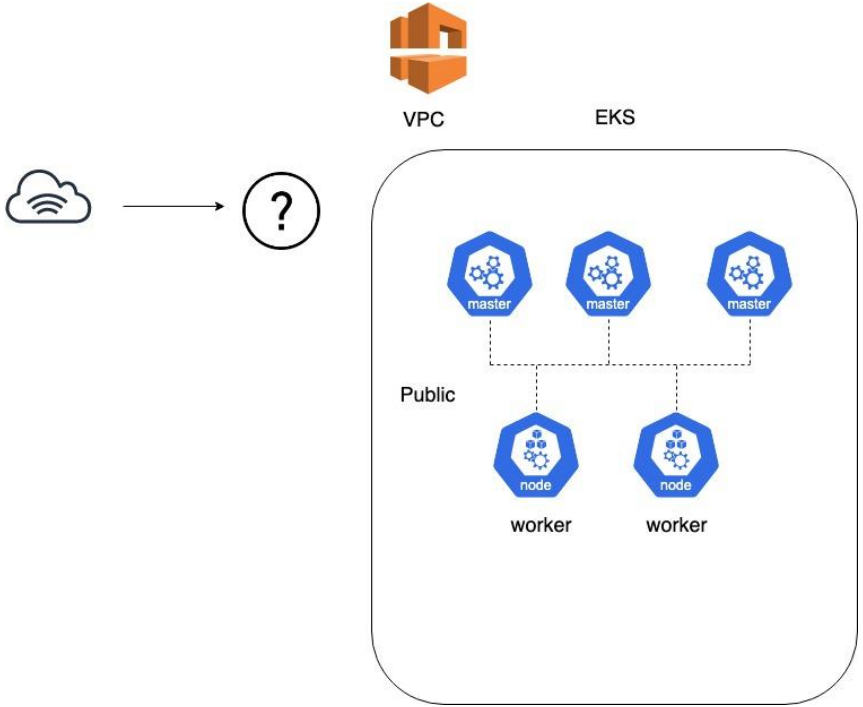
EKS

Kubernetes cluster (default) setup with 3 masters and 2 worker nodes

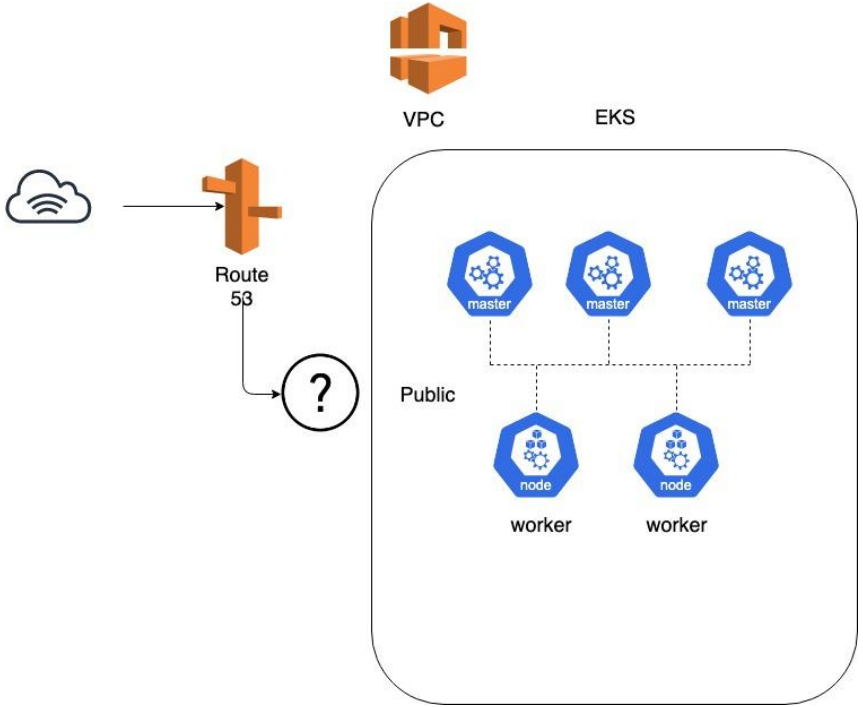


Incoming request - how to reach our Spring Boot application?

EKS

Route 53 hosted zone catches all the requests

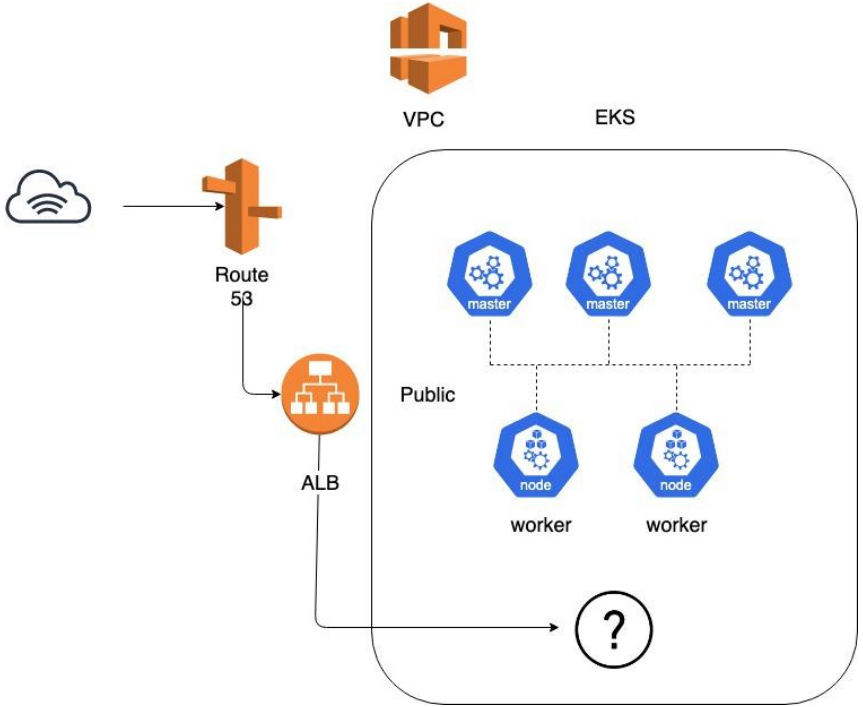
eks.ordina-jworks.io is the root domain for this cluster



EKS

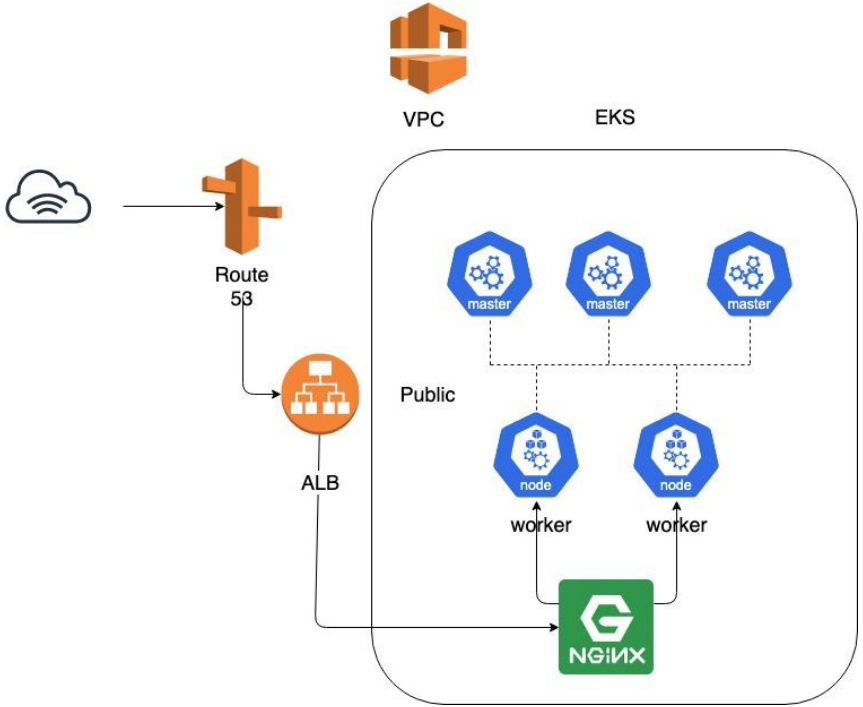
ALB (Application Load Balancer) distributes the request to the respective pod

*ALB matches on the target group



EKS

NGINX sends the request to the appropriate Kubernetes service



AUTHENTICATION

How do we access the cluster?

- The owner of the cluster has full admin access by default
- Since multiple people use our AWS account we probably want to give multiple people access to the cluster as well
- We can use AWS IAM authentication in combination with Kubernetes RBAC to enable kubectl for other people

AUTHENTICATION

AWS IAM

- Users, Groups, Roles
  - A user belongs to a group
  - A group has policies attached
  - A user can assume a Role

Users | Permissions | Access Advisor

Managed Policies

The following managed policies are attached to this group. You can attach up to 10 managed policies.

Attach Policy

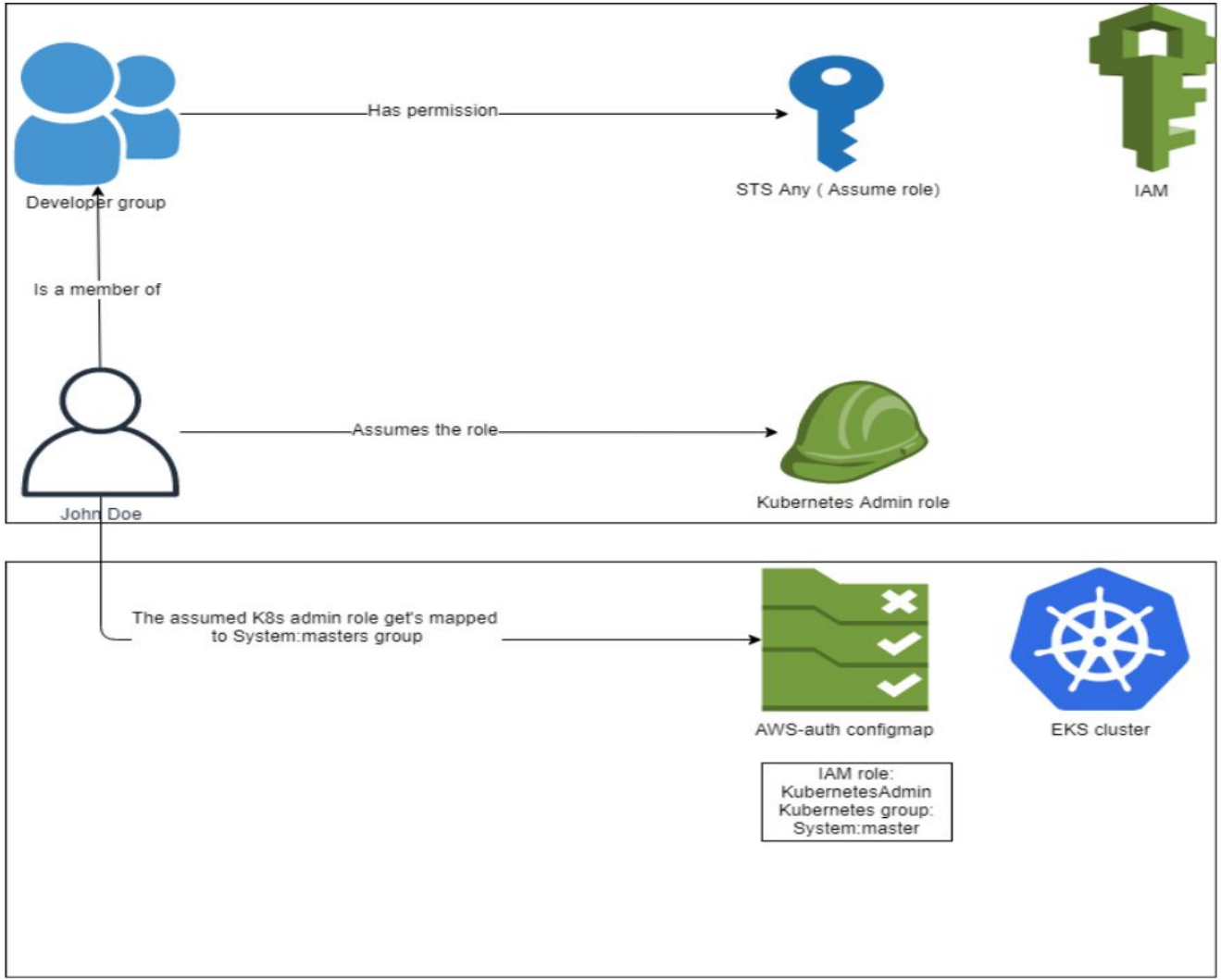
Policy Name	Actions
AmazonAPIGatewayAdministrator	Show Policy | Detach Policy | Simulate Policy
CloudwatchDeveloperPolicy	Show Policy | Detach Policy | Simulate Policy
LambdaDeveloperPolicy	Show Policy | Detach Policy | Simulate Policy
IAMDeveloperPolicy	Show Policy | Detach Policy | Simulate Policy
StsAny	Show Policy | Detach Policy | Simulate Policy

KUBERNETES RBAC

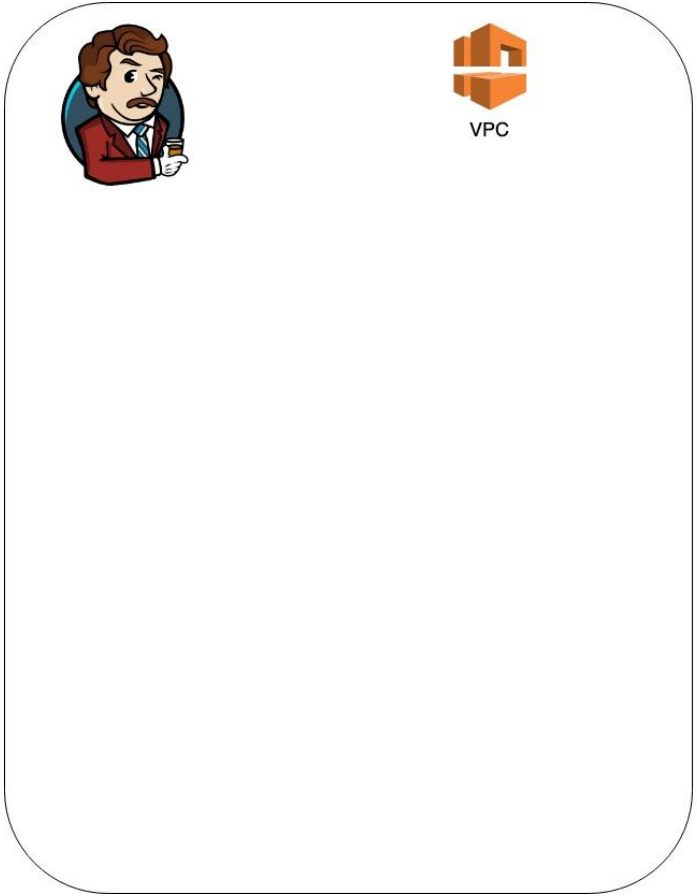
Authentication inside the cluster

- Configmap aws-auth in cluster
- You can bind IAM users / roles to Kubernetes groups.

```
  - rolearn: arn:aws:iam::163091829738:role/KubernetesAdmin
    username: kubernetes-admin
    groups:
      - system:masters
```


Developer group
Has permission
STS Any (Assume role)
IAM
Is a member of
John Doe
Assumes the role
Kubernetes Admin role
The assumed K8s admin role get's mapped
to System:masters group
AWS-auth configmap
EKS cluster
IAM role:
KubernetesAdmin
Kubernetes group:
System:master

JENKINS



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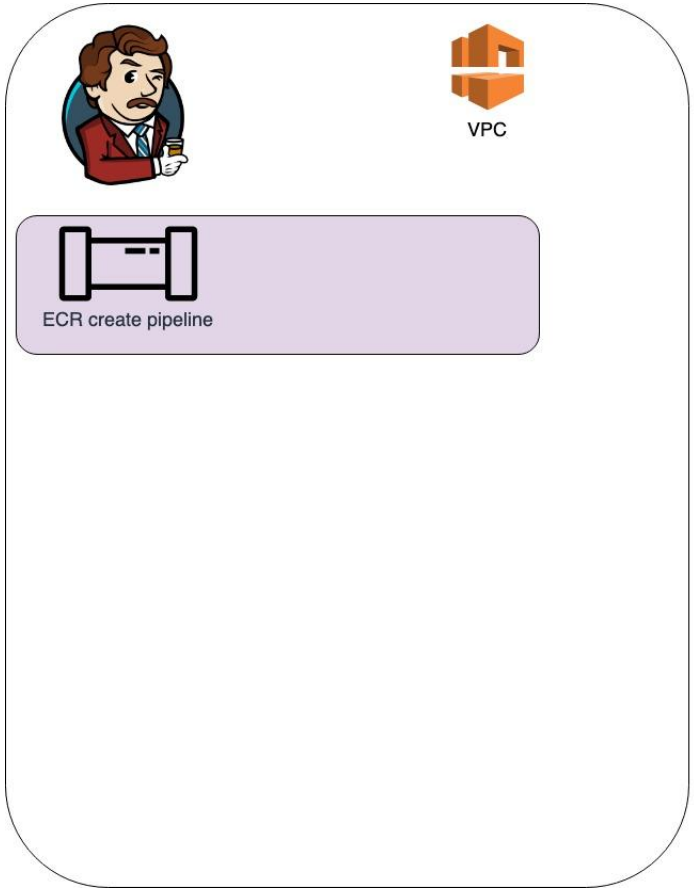

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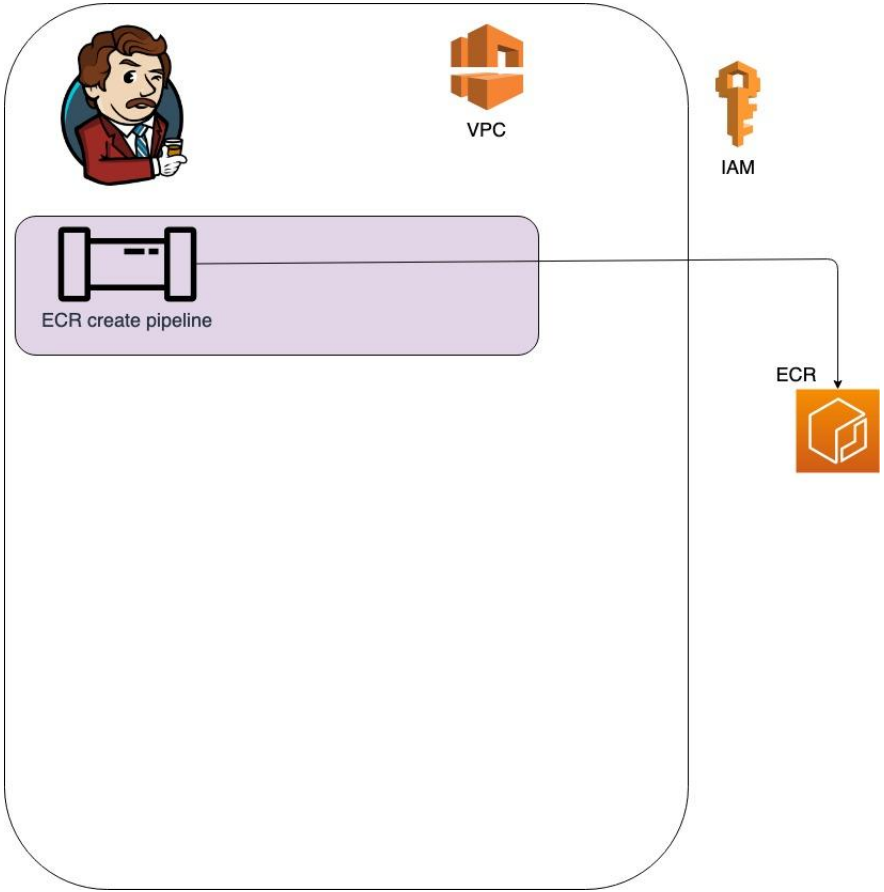

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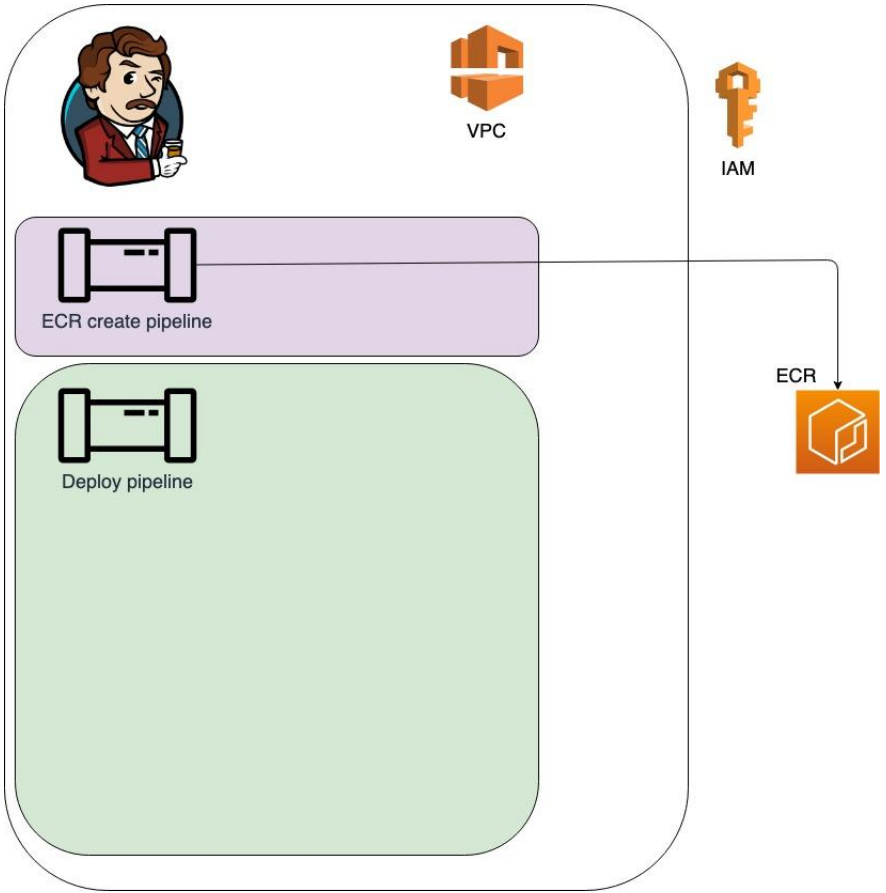

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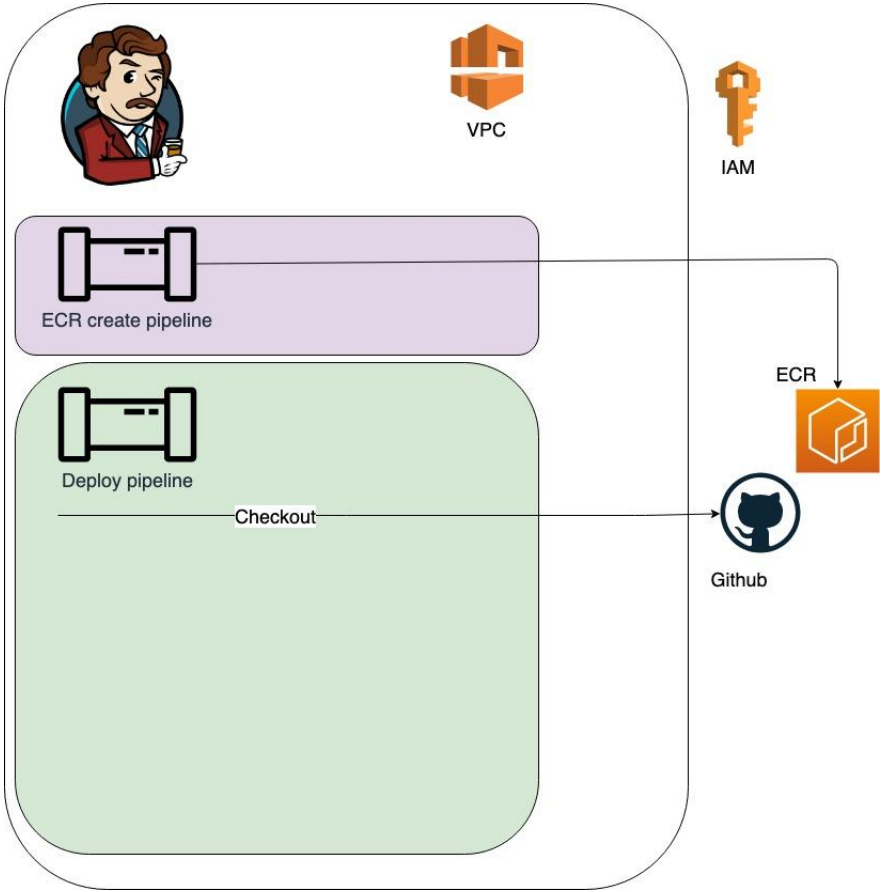

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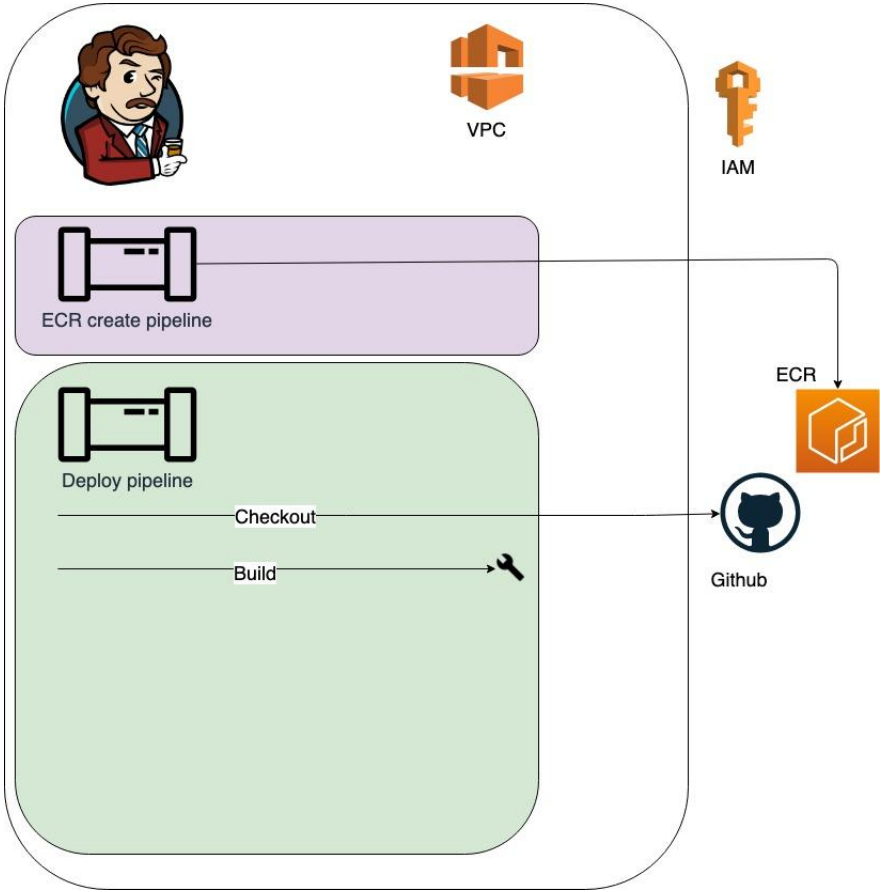

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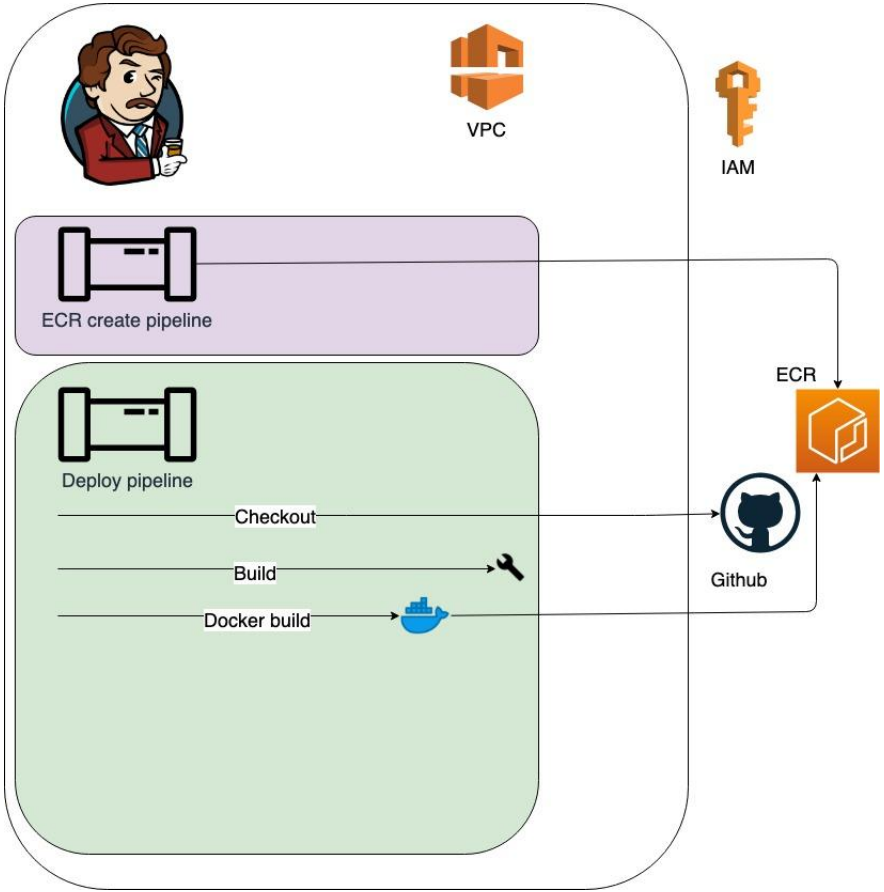

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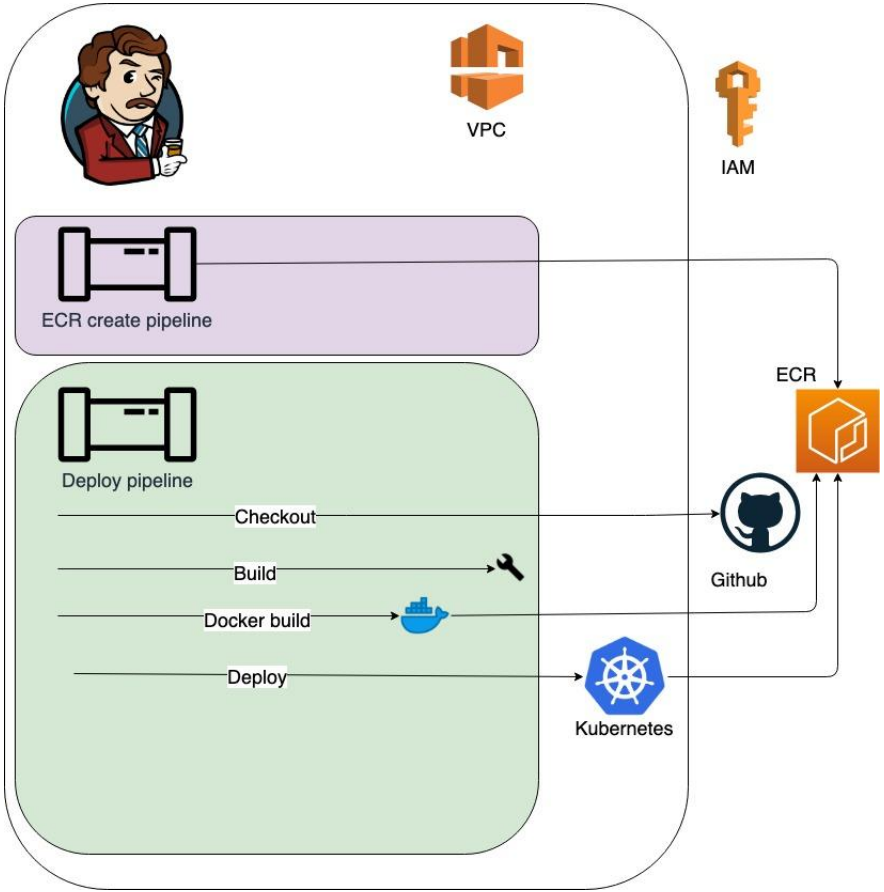


WORKSHOP TIME

WORKSHOP

Prerequisites

- Python (3 preferred) & pip
  - Mac: brew install python3 python3-pip
  - Windows: https://www.python.org/downloads/windows/
- Kubectl
  - https://docs.aws.amazon.com/eks/latest/userguide/install-kubectl.html
- aws-cli (needs Python 3 and pip)
  - https://docs.aws.amazon.com/cli/latest/userguide/cli-chap-install.html
- aws-iam-authenticator
  - https://docs.aws.amazon.com/eks/latest/userguide/install-aws-iam-authenticator.html

TOOLS & TIPS

Tools to improve your productivity

- Kubectx
  - Easily switch between clusters and Kubernetes providers
  - https://github.com/ahmetb/kubectx/
- Kubens
  - Easily switch between namespaces
  - https://github.com/ahmetb/kubectx/blob/master/kubens

WORKSHOP

- Teams of 2
- Basic Spring Boot TODO application
  - Every team has his own branch
  - Clone the repo with your branch: git clone -b <branch name> git@github.com:ordina-jworks/k8s-demo.git
  - Please ask for access if you don't have access to the repository
- Create a Dockerfile which will create a Docker image of our application
- Create a YAML file that handles the deployment of the application on Kubernetes
- Setup a Jenkins pipeline to build and deploy your image on the Kubernetes cluster
- At the end of the workshop, your application should be available on the cloud with the help of an automatic pipeline

How do I ‘dockerize’ my Spring Boot application?

- Use JRE, not JDK
  - You don’t need the full JDK to run a Java application!
- Use alpine image if you can
  - Very lightweight
  - Only contains the basics

How do I ‘dockerize’ my Spring Boot application?

- Docker build & run (for testing purposes)
  - docker build -t k8s-demo .
  - docker run -p 8080:8080 k8s-demo
    - Open port 8080 from your Docker container to your machine
  - Environment variables
    - docker run -p 8080:8080 -e “WELCOME_NAME=JWorks” k8s-demo

Deploying my Docker image to a Kubernetes cluster

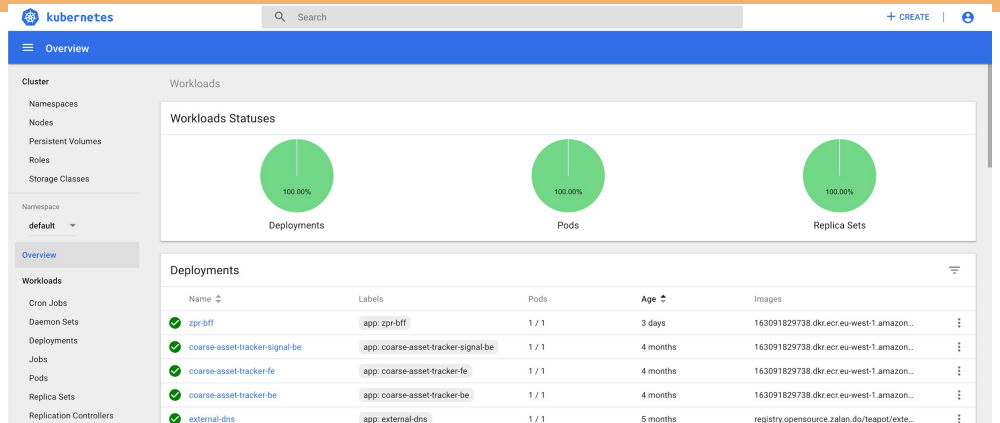
- Set your base path in application-prod.properties for Thymeleaf support
  - ex. for team 3: k8s-demo-team3
- Recreate our Docker image
  - Need to create a Docker repository first!
  - New docker image with new name and tag from our Docker repository
  - Authenticate with ECR
    - aws ecr get-login --region eu-west-1 --no-include-email
- Kubernetes uses YAML files
- Enable production mode in Spring Boot in YAML
  - name: SPRING_PROFILES_ACTIVE
  - value: prod
- Ingress

WORKSHOP

Kubernetes Dashboard

- Execute the following command in the Terminal:
  kubectl proxy
- Get token:
  - http://localhost:8001/api/v1/namespaces/kube-system/services/https:kubernetes-dashboard:/proxy/#!/login
- Then navigate to:

http://localhost:8001/api/v1/namespaces/kube-system/services/https:kubernetes-dashboard:/proxy/#!/login



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WORKSHOP

Jenkins pipeline

- Automatic pipeline which will deploy your application
- Use environment variables from Jenkins
  - Image name: <project_name>:$BUILD-NUMBER-$GIT_COMMIT
  - use envsubst pipe for YAML files
    - YAML can’t process environment variables
    - envsubst replaces environment variables with values

```
envsubst < k8s/demo-deployment.yaml | kubectl apply -f -
```

TRY THIS AT HOME

Want to set up your own Kubernetes cluster to play with?

- Various free K8S providers for testing purposes
  - https://tryk8s.com/
  - https://kubesail.com/
  - Minikube - A local Kubernetes cluster for testing purposes only!
  - Free signup credits from AWS / GCP
  - MicroK8s
  - Can also use the AWS JWorks account!
- Learn more about AWS / EKS:
  - https://www.aws.training/
  - https://eksworkshop.com/
  - JWorks Docs: https://jworks.cfapps.io/
- Learn more about Kubernetes:
  - Kubernetes official documentation: https://kubernetes.io/
  - Blogpost: https://ordina-jworks.github.io/cloud/2019/08/05/deploy-spring-boot-kubernetes.html